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It may be said that, so far as the abundance of the elements goes, the system seems to play out at the end of the first eighth group in the periodic system. It may be of interest to note here, what has been pointed out in former papers, that it is just at this point in the system that the atomic weights cease any longer to be very close to whole numbers, as they are for the lighter weight elements. Also just at this point the exact formula given for the elements ceases to hold well. These facts do not mean however, that the system fails beyond the iron group of elements; for it is just among the heaviest elements that it received its verification by the actual decomposition of the elements into helium.

The complete paper of which this is an abstract, will be published later. I wish to thank Prof. C. W. Balke of the University of Illinois for suggestions in regard to the relative abundance of the elements of the rare earth group.

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[1] Harkins and Wilson, These PROCEEDINGS, **1**, 276 (1915); *J. Amer. Chem. Soc.*, **37**, 1367–1421 (1915); *Phil. Mag.*, **30**, 723 (1915).

[2] Harkins and Hall, *J. Amer. Chem. Soc.*, **38**, 186–8, 203–5, 211–14 (1916).

[3] H. Buisson, Ch. Fabry, and H. Bourget, *Astrophys. J.*, **40**, 256 (1914). See also Dempster, *Ann. Physik.*, **47**, 792 (1915).

[4] Wright, These PROCEEDINGS, **1**, 590–5 (1915).

[5] Farrington, Publications 120 and 151, Field Columbian Museum, Chicago.

[6] Clarke, *The Data of Geochemistry*, Bulletin 491, Department of the Interior (1911); see also Bulletin 616 (1915).

[7] Lunn, in 'Tidal and Other Problems,' pp. 201–18, Carnegie Institution (1909).

THE GENETIC RELATIONS OF CERTAIN FORMS IN AMERICAN ABORIGINAL ART

By Clark Wissler

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY

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One of the most difficult problems in anthropology has been the working out of successive steps in the origins of particular traits of culture. The most intensive effort seems to have been made in studies on the evolution of decorative designs. By arranging designs found upon prehistoric or other pottery in order of their increasing conventionality, series have resulted, showing a clearly realistic drawing at one end and an almost entirely geometrical one at the other. Such series suggest that all these forms were arrived at by first drawing from real life and then by successive conventionalizations arriving at a pure geometric form. The weak point in this interpretation is that there are no means of dating the units of the series, their arrangement being merely a matter of selection on the part of the observer. There are still other obvious objections to the interpretation, so that the tendency of the critical is to reject these conclusions. Somewhat analogous attempts have been made in the study of industrial arts and technology, but with equally unconvincing results. Consequently, as the case stands today, we can point to scarcely a single example in which the life history of a trait can be satisfactorily demonstrated in objective data.

In the course of some technological studies in the American Museum of Natural History, the writer observed that certain structural styles of skin clothing among the Indian tribes of the Mississippi and Great Lakes areas were clearly due to the forms of the original materials. The skins of deer were used and practically always removed from the animal in the same way. Whole skins were then combined to form a garment, their natural outlines being preserved, but usually trimmed to a symmetrical form. That the cut, or style, thus resulting became a recognized feature in the native mind is shown by its survival after cloth was introduced by traders. Here the form of the material did not lend itself to the style but nevertheless was cut to conform to it. Hence, we have a case in which the evidence for the genesis of a trait is satisfactory.

Next our attention was turned to the decorations upon these costumes. Here it can be shown that these same stylistic lines, determined by the contours of the material, were followed in the embroidered decorations, resulting in peculiar curved designs. Thus on the old specimens in our collections, the design follows the cut of the skin material, but upon the modern ones it is repeated upon an even unbroken surface. So without going into details we may state that satisfactory proof can be given to show that this particular design rose from the decoration following the contour of a part of the garment.

The investigation was then extended to moccasin decoration in the same geographical area. In this case satisfactory evidence can be found for the same kind of genetic relation between three different styles of decoration and as many different types of structure. For instance, north of the Great Lakes, for a considerable distance, east and west, the moccasin is made by folding a piece of skin up over the foot and joining on the top and at the heel. The shape of the foot prevents its covering the entire instep, leaving a U-shaped space. This is closed by an insert. The decoration is placed upon this insert, for which there are good technological reasons, and so has in its entirety a U-shape. Then among some of the neighbors of these tribes, particularly the Blackfoot, we find a similar decoration upon a mocassin of an entirely different pattern and one in which it bears no necessary relation to the structure. Yet these Indians are consistent enough to make a false insert upon which the decoration is placed. In short, there are very strong reasons for concluding that the Blackfoot borrowed the decoration from their northern neighbors and that these tribes arrived at it by adjusting the decoration to the structure.

Another cut of moccasin among some tribes south of the Great Lakes requires no insert on the instep, but has a long unsightly puckered seam, extending down the middle of the foot to the toe. This is usually concealed by overlaying with a long narrow band of embroidered skin. This style extends over into the tribes of the Plains to the west where we find it upon moccasins of a pattern having no seams to hide.

Again, the Apache of New Mexico and Arizona have a moccasin with a long narrow insert reaching down the top of the foot to the toe. This gives two converging seams which are concealed by fringes and very narrow embroidered bands. Then among their northern neighbors we find moccasins without any insert whatever bearing exactly the same decoration.

Thus, in moccasin decoration we find three different examples of decorative designs developed from the structure.

We may summarize this investigation as revealing several good examples of the genesis of specific decorative designs. With one possible exception, they differ from the previous genetic studies of design in that the origin was not strictly in attempts at realistic art but merely grew out of attempts to embellish surfaces of fixed contour and to conceal unsightly lines.

The data in full will appear in the *Anthropological Papers of the American Museum of Natural History.*

THE SITUATION IN REGARD TO ROWLAND'S PRELIMINARY TABLE OF SOLAR SPECTRUM WAVE-LENGTHS

By Charles E. St. John

MOUNT WILSON SOLAR OBSERVATORY, CARNEGIE INSTITUTION OF WASHINGTON

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The appearance of the *Preliminary Table of Solar Wave-lengths* marked an epoch in the history of spectroscopy and for twenty years it has been an instrument of precision in the hands of the solar and stellar investigator, to such a degree that it has become an integral part of the literature of spectroscopy. In the transition to the international system, all that is of permanent value in this work of great magnitude and im-